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# UTILITY PATENT APPLICATION TRANSMITTAL

*(Only for new nonprovisional applications under 37 CFR 1.53(b))*

| | |
|---|---|
| *Attorney Docket No.* | MUL1612-002 |
| *First Inventor* | Flanagan et al. |
| *Title* | SYSTEM AND METHOD FOR CLOSED CAPTION DATA TRANSLATION |
| *Express Mail Label No.* | EL622262384US |

JC929 U.S. PTO 09/695631 10/24/00

## APPLICATION ELEMENTS

*See MPEP chapter 600 concerning utility patent application contents.*

*ADDRESS TO:* Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. [X] **Fee Transmittal Form (e.g., PTO/SB/17)** *(Submit an original and a duplicate for fee processing)*
2. [X] **Applicant claims small entity status.** See 37 CFR 1.27.
3. [X] **Specification** [Total Pages 18 ] *(preferred arrangement set forth below)*
   - Descriptive title of the invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (if filed)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [X] Drawing(s) (35 U.S.C. 113) [Total Sheets 5 ]
5. Oath or Declaration [ Total Pages 3 ]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1 63 (d)) *(for continuation/divisional with Box 17 completed)*
      i. [ ] DELETION OF INVENTOR(S) **Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).**
6. [ ] Application Data Sheet. See 37 CFR 1 76
7. [ ] **CD-ROM or CD-R in duplicate, large table or Computer Program** *(Appendix)*
8. **Nucleotide and/or Amino Acid Sequence Submission** *(if applicable, all necessary)*
   a. [ ] **Computer Readable Form (CRF)**
   b. **Specification** Sequence **Listing on:**
      i. [ ] **CD-ROM or CD-R (2 copies); or**
      ii [ ] **paper**
   c [ ] Statements verifying **identity of above copies**

## ACCOMPANYING APPLICATION PARTS

9. [X] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [X] Information Disclosure Statement (IDS)/PTO-1449 [X] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Other:

17. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No. _____ / _____

Prior application information: Examiner _____ Group/ Art Unit: _____

**For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 6b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.**

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| *Name (Print/Type)* | CAROL G. STOVSKY | *Registration No. (Attorney/Agent)* | 42,171 | | |
| *Signature* | Carol G. Stovsky | *Date* | October 24, 2000 | | |

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# FEE TRANSMITTAL for FY 2000

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TOTAL AMOUNT OF PAYMENT ($) 423.00

| Complete if Known | |
|---|---|
| Application Number | |
| Filing Date | October 24, 2000 |
| First Named Inventor | Flanagan et al. |
| Examiner Name | |
| Group Art Unit | |
| Attorney Docket No. | MUL1612-002 |

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1. ☐ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

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☐ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17

☐ Applicant claims small entity status See 37 CFR 1.27

2. ☒ Payment Enclosed:

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## FEE CALCULATION

### 1. BASIC FILING FEE

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|---|---|---|---|---|---|
| 101 | 710 | 201 | 355 | Utility filing fee | 365.00 |
| 106 | 310 | 206 | 155 | Design filing fee | |
| 107 | 480 | 207 | 240 | Plant filing fee | |
| 108 | 690 | 208 | 345 | Reissue filing fee | |
| 114 | 150 | 214 | 75 | Provisional filing fee | |

SUBTOTAL (1) ($) 365.00

### 2. EXTRA CLAIM FEES

| | | | Extra Claims | | Fee from below | | Fee Paid |
|---|---|---|---|---|---|---|---|
| Total Claims | 22 | -20 ** = | 2 | x | 9.00 | = | 18.00 |
| Independent Claims | 3 | -3 ** = | 0 | x | | = | 0.00 |
| Multiple Dependent | | | | | | = | 18.00 |

** or number previously paid, if greater, For Reissues, see below

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description |
|---|---|---|---|---|
| 103 | 18 | 203 | 9 | Claims in excess of 20 |
| 102 | 78 | 202 | 39 | Independent claims in excess of 3 |
| 104 | 260 | 204 | 130 | Multiple dependent claims, if not paid |
| 109 | 78 | 209 | 39 | ** Reissue independent claims over original patent |
| 110 | 18 | 210 | 9 | ** Reissue claims in excess of 20 and over original patent |

SUBTOTAL (2) ($) 18.00

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 105 | 130 | 205 | 65 | Surcharge - late filing fee or oath | |
| 127 | 50 | 227 | 25 | Surcharge - late provisional filing fee or cover sheet | |
| 139 | 130 | 139 | 130 | Non-English specification | |
| 147 | 2520 | 147 | 2520 | For filing a request for ex parte reexamination | |
| 112 | 920 | 112 | 920 | Requesting publication of SIR prior to Examiner Action | |
| 113 | 1840 | 113 | 1840 | Requesting publication of SIR after Examiner Action | |
| 115 | 110 | 215 | 55 | Extension for reply within first month | |
| 116 | 380 | 216 | 190 | Extension for reply within second month | |
| 117 | 870 | 217 | 435 | Extension for reply within third month | |
| 118 | 1360 | 218 | 680 | Extension for reply within fourth month | |
| 128 | 1850 | 228 | 925 | Extension for reply within fifth month | |
| 119 | 300 | 219 | 150 | Notice of Appeal | |
| 120 | 300 | 220 | 150 | Filing a brief in support of an appeal | |
| 121 | 260 | 221 | 130 | Request for oral hearing | |
| 138 | 1510 | 138 | 1510 | Petition to institute a public use proceeding | |
| 140 | 110 | 240 | 55 | Petition to revive - unavoidable | |
| 141 | 1210 | 241 | 605 | Petition to revive - unintentional | |
| 142 | 1210 | 242 | 605 | Utility issue fee (or reissue) | |
| 143 | 430 | 243 | 215 | Design issue fee | |
| 144 | 580 | 244 | 290 | Plant issue fee | |
| 122 | 130 | 122 | 130 | Petitions to the Commissioner | |
| 123 | 50 | 123 | 50 | Petitions related to provisional applications | |
| 126 | 240 | 126 | 240 | Submission of Information Disclosure Stmt | |
| 581 | 40 | 581 | 40 | Recording each patent assignment per property (times number of properties) | 40.00 |
| 146 | 690 | 246 | 345 | Filing a submission after final rejection (37 CFR Section 1 129(a)) | |
| 149 | 690 | 249 | 345 | For each additional invention to be examined (37 CFR Section 1 129(b)) | |
| 179 | 710 | 279 | 355 | Request for Continued Examination (RCE) | |
| 169 | 900 | 169 | 900 | Request for expedited examination of a design application | |

Other fee (specify): _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40.00

## SUBMITTED BY

Complete *(if applicable)*

| Name (Print/Type) | Carol G. Stovsky | Registration No (Attorney/Agent) | 42,171 | Telephone | (614) 792-5555 |
|---|---|---|---|---|---|
| Signature | Carol G. Stovsky | | | Date | October 24, 2000 |

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| STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) & 1.27(c))-- SMALL BUSINESS CONCERN | Docket Number (Optional) MUL1612-002 |
|---|---|

Applicant, Patentee, or Identifier: Mary A. Flanagan, Philip Jensen, and Douglas P. Chinnock

**Application or Patent No.:**

**Filed or Issued:** October 24, 2000

Title: SYSTEM AND METHOD FOR CLOSED CAPTION DATA TRANSLATION

I hereby state that I am

☒ the owner of the small business concern identified below:

☒ an official of the small business concern empowered to act on behalf of the concern identified below:

**NAME OF SMALL BUSINESS CONCERN** MultiLingual Media, Inc.

**ADDRESS OF SMALL BUSINESS CONCERN** 61 Nicholas Road, Suite B#, Framingham, Massachusetts 01701

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NAME OF PERSON SIGNING Mary Flanagan

TITLE OF PERSON IF OTHER THAN OWNER President

ADDRESS OF PERSON SIGNING 61 Nicholas Road, Suite B3, Framingham, MA 01701

SIGNATURE Mary A. Flanagan DATE 10-10-00

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APPLICATION FOR UNITED STATES LETTERS PATENT

FOR

# SYSTEM AND METHOD FOR CLOSED CAPTION DATA TRANSLATION


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Douglas P. Chinnock

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SYSTEM AND METHOD FOR CLOSED CAPTION DATA TRANSLATION

Inventors: Mary A. Flanagan
Philip Jensen
Douglas P. Chinnock

## Technical Field

The present invention relates to transmission of closed caption data with broadcast signals. In particular, the present invention relates to translation of closed caption data from a source language to a target language.

## Background of the Invention

Despite the widespread access to television technology worldwide, language remains a barrier to broad dissemination of program content. More television content is developed in English than in any other language, yet English is spoken by only a tiny fraction of the world's population. Likewise, programming developed in other languages is inaccessible to speakers of English. A small amount of this content is translated by traditional means at high cost and with delays of weeks or even months. However, for television content that is perishable in nature, such as news, sports, or financial programs, there is no solution to broad distribution across languages. Such programming rapidly decreases in relevance over time, making the translation delays of weeks or more unacceptable. As a result, virtually all live television content goes untranslated, with different live programming developed specifically for each language market.

Live and time-sensitive television content is increasingly being delivered over the Internet in the form of streaming video. Broadband Internet access, a de facto

requirement for consumer access to streaming video, is being rapidly adopted by U.S. households. Market research suggests that by 2003, close to 9 million U.S. households will subscribe to a cable modem, up from 1.3 million at 1999 year-end. In Western Europe, exponential growth is predicted in the use of cable modems over the 1998-2003 time frame, and surveys are already showing that high speed access (ISDN or greater) is the predominant mode of Internet access. Regardless of the whether the delivery medium is a television set or an Internet-ready computer, language remains the critical barrier to widespread use of this broadcast content.

## Summary of the Invention

The present invention is a system and method for translating closed caption data. Closed caption data received from a television broadcast are translated, virtually in real-time, so that a viewer can read the closed caption data in his or her preferred language as the television program is broadcast. The present invention instantly localizes television program content by translating the closed caption data. The process of the present invention is fully automated, and may be used in conjunction with any machine translation system that has adequate performance to process translation in real-time to keep up with the program flow of caption data. A server supports real-time translation of eight television channels simultaneously, and translations are produced with less than a one-second delay. The server can produce either closed caption or subtitled output. An optional Separate Audio Program (SAP) may be added to the output that contains a computer generated speech rendering of one translation.

In accordance with the present invention, closed caption data is pre-edited to correct errors, recognize relevant text breaks, and enhance input quality to the machine translation system. For example, misspellings in the caption data are corrected before machine translation so that the machine translation system provides a correct translation from the source language to the target language. Incomplete sentences are detected and flagged or expanded so that the machine translation system provides a more accurate translation. The pre-editing process, which is unique to the present invention, results in high quality translations from commercially available machine translation systems. A unique text-flow management process further facilitates the processing and translating of text through the various components of the present invention.

**Brief Description of the Drawings**

Fig. 1 is a schematic diagram of the primary components for translation of streamed captions in accordance with an example embodiment of the present invention;

Fig. 2 is a schematic diagram of the primary components for translation of closed caption data with a combination decoder/subtitler device in accordance with an example embodiment of the present invention;

Fig. 3 is schematic diagram of the primary components for translation of time positioned captions in accordance with an example embodiment of the present invention;

Fig. 4 is a flowchart of the primary steps for closed caption text flow management in accordance with an example embodiment of the present invention; and

Fig. 5 is a flowchart of the primary steps for pre-editing of closed caption data in accordance with an example embodiment of the present invention.

Detailed Description of the Drawings

Referring to Fig. 1, a schematic diagram of the primary components for translation of streamed captions in accordance with an example embodiment of the present invention is shown. The program source 100 signal originates from a videotape recorder (VTR) or feed from a live cable or satellite signal. The program source 100 video, which may be in either National Television Systems Committee (NTSC) signal 104 format or National Association of Broadcasters (NAB) format consisting of video and closed caption (CC) data in the vertical blanking interval (VBI), is provided to both the CC decoder 106 and to the CC encoder 116 and another device 122. The other device 122 may be a subtitler that produces subtitles from translated text 114 received from the MT computer 110. Alternatively (or in addition), the other device 122 may be a text-to-speech (TTS) device (e.g., Lucent Technologies' "Lucent Speech Solutions" product) that synthesizes speech from the translated text 114. The synthesized speech from the TTS device 122 is placed into the Separate Audio Program (SAP) portion of the audio signal 102. Although Fig. 1 shows transmission of the NTSC signal 104 to the CC encoder 116 and the other device 122 (e.g., subtitler or TTS device), in alternative embodiments of the present invention, the NTSC signal 104 may be transmitted to either the CC encoder 116 or the other device 122 and the MT computer may be adapted to send translated CC data 112 to a CC encoder 116 or translated text 114 to another device 122. Any type of signal that comprises closed caption data may be

directed to the MT computer 110 for translation. In addition to the NTSC signal, the present invention may also be used with the European NAB format program signal.

The CC decoder 106 extracts the CC codes (which consist of text, position, and font information) from the NTSC signal 104 and provides them to the MT computer 110 as a serial stream. In an example embodiment of the present invention, source language CC codes 108 may be transmitted from the CC decoder 106 to the MT computer 110.

The machine translation or MT computer 110 is a server that may be a Windows NT/2000 PC equipped with two serial ports. The MT computer 110 comprises machine translation (MT) software that performs automatic translation of human languages such as Transparent Language's Transcend SDK, Version 2.0. The MT software translates text from a first or source language to text in a second or target language. The MT software on the MT computer 110 translates the source language text stream or CC codes 108 from the CC decoder 106 to a target language. The target language may be any language (e.g., French, German, Japanese, or English) supported by the MT software on the MT computer 110. Then, the MT computer 110 merges the translated text stream with position and font information from the original CC codes. Resulting translated CC data 112 are transmitted to the CC encoder 116 as a serial stream. Resulting translated text 114 is transmitted to the other device 122 (e.g., subtitler or TTS device), also as a serial stream.

The CC encoder 116 combines the NTSC signal 104 or video portion of the program from the program source 100 and the translated CC data 112 from the MT computer 110 to produce a new, translated NTSC video signal 118. The translated

NTSC signal 118 is transmitted to the program destination 120. The final NTSC video signal 118, along with the audio signal 102 of the program source 100, is provided to the program destination 120, which may be a VTR or feed for a television or Internet broadcast.

Similarly, if the other device 122 is a subtitler, it combines the NTSC signal 104 or video portion of the program from the program source 100 and the translated text 114 from the MT computer 110 to produce a new, translated NTSC video signal 124. The translated NTSC signal 124 is transmitted to the program destination 126. The final NTSC video signal 124, along with the audio signal 102 of the program source 100, is provided to the program destination 126, which may be a VTR or feed for a television or Internet broadcast. In addition, or alternatively, if the other device 122 is a TTS device, it combines the audio signal 102 from the program source 100 to produce a SAP channel for the audio provided to the program destination 126.

Referring to Fig. 2, an example embodiment of the present invention is shown in which closed caption data is translated for a program destination in accordance with a combination decoder/subtitler device (e.g., an Ultech SG401). Audio signals 202 and NTSC signals 204 originate from a program source 200. The NTSC signal 204 or video signal (which consists of video and CC data) is transmitted from the program source 200 to an Ultech SG401 device that comprises a CC decoder 206 and subtitler 208. The CC decoder 206 extracts the source language CC codes 210 which consist of text, position, and font information and provides them to the MT computer 212 as a serial stream. The MT computer 212, which comprises MT software as explained above, translates the source language CC codes 210 from the CC decoder 206. The MT

computer 212 merges the translated data with position and font information and provides the resulting translated text 214 to the subtitler 208, also as a serial stream. The subtitler 208 combines the video portion of the program from the program source and the translated text 214 from the MT computer 212. The result is a new translated NTSC signal 216 with translated subtitles. The final NTSC signal 216, along with the audio signal 202 from the program source 200, is provided to program destination 218 which may be a VTR or feed for a television or Internet broadcast. In addition, the translated text 214 may be processed by a text-to-speech (TTS) module (e.g., Lucent Technologies' "Lucent Speech Solutions" product) that synthesizes speech which is placed into the Separate Audio Program (SAP) portion of the audio signal provided to program destination 218.

Referring to Fig. 3, a schematic diagram of the primary components for translation of time positioned captions in accordance with an example embodiment of the present invention is shown. The program source 300 NTSC signals 304 are processed in two tape passes. The NTSC signals 304 originate from a VTR program source 300. The NTSC signals 304 from the VTR program source 300 consist of video and caption data in the VBI. The NTSC signals 304 are transmitted from the program source 300 to the CC decoder 306. In addition, timing codes 310 are sent from the VTR program source 300 to a MT computer 312. The MT computer 312 may be adapted to send translated CC data 314 to a CC encoder 318 or translated text 316 to another device 324 such as a subtitler or TTS device.

The CC decoder 306 extracts the source language CC codes 308 which consist of text, position, and font information and provides them to the MT computer 312 as a

serial stream. The MT computer 312 records, to a first file, the timing codes 310 and CC codes 308 for the entire program. The MT computer 312 then processes the first file to produce a second file with timing, translated data, position, and font information.

Next, a second pass of the program source tape 300 is made. On the second pass, the timing codes 310 are used by the MT computer 312 to determine when to send translated CC data 314 to the CC encoder 318 or the translated text 316 to the other device (e.g., subtitler or TTS device). The CC encoder 318 combines the video portion or NTSC signals 304 from the program source 300 and the translated CC data 314 from the MT computer 312. The result is a new translated NTSC signal 320 that is transmitted from the CC encoder 318 to a program destination 322.

Alternatively, or in addition, the other device 324 (e.g., subtitler or TTS device) combines the video portion or NTSC signals 304 from the program source 300 and the translated text 316 from the MT computer 312. The result is a new translated NTSC signal 326 that is transmitted from the other device 324 to a program destination 328.

In accordance with the present invention, the server, shown as the MT computer in Figs. 1, 2, and 3, in addition to MT software, may further comprise text flow management software and pre-editing software. Referring to Fig. 4, the primary steps for closed caption text flow management in accordance with an example embodiment of the present invention are shown. In an example embodiment of the present invention, the text flow management software, which is unique to the present invention, executes on a computer that also performs the machine translation. In an alternative embodiment of the present invention, the text flow management software and machine translation may execute on different computers that are connected or on a network. In

the first step 400, the text flow management software receives signals from a program source such as a television broadcast or videotape recorder. In the next step 402, an incoming stream of plain text that is present in the program source as text occurring in fields CC1, CC2, CC3, or CC4 in line 21 of the VBI is decoded or extracted using a closed caption (CC) decoder that passes the CC text to the text flow management software. An example device is the Ultech SG401 that operates as a closed caption decoder or subtitle character generator.

In the next step 404, the CC text is pre-edited to correct errors in closed captions, recognize relevant text breaks, and enhance input quality. The pre-edited text is translated from a source language to a target language using machine translation software in step 406. An example of machine translation software that may be used with the present invention is Transparent Language's Transcend SDK MT program.

In step 408, the target language text produced by the MT software is inserted into the video signal. It may be inserted as subtitles using the Ultech SG401 character generator or as closed captions replacing the original CC field or any of the fields CC1, CC2, CC3, or CC4 using CC encoder equipment from many suppliers. Finally, in step 410, the target language text is sent as a standard NTSC signal to a program destination for broadcast or recording to videotape recorder. The output of the text flow management process is a television program with translated closed captions or subtitles, depending on user preference. The closed captions or subtitles are properly synchronized with the program, either through producing the translations in real-time, or in some cases, through buffering the audio and video during the translation process, and reuniting audio, video, and text once the translations are complete.

Referring to Fig. 5, the primary steps for pre-editing of closed caption data in accordance with an example embodiment of the present invention are shown. The pre-edit software, which is unique to the present invention, solves several problems associated with real-time closed caption translation.

One problem with real-time closed caption translation is producing adequate quality translations, and doing so quickly enough so that the captions or subtitles keep pace with the live running video. Producing high quality translation of this unique text type involves several related problems. Captions that are produced on the fly for live programming such as news tend to have numerous misspellings and phonetic renderings of correct spellings. The misspellings result from the on-the-spot nature of the captioning task. Captioners who create the source language closed caption data must keep up with the real-time flow of speech. They are trained to use techniques such as phonetic spelling to quickly render proper names and other terms whose spelling cannot be determined instantly. The phonetic spellings often differ from common misspellings that occur when words are typed. Commercially available spell checking programs are not adequate for correcting these types of spellings. Because translation technology fails to recognize misspelled terms, the quality of the resulting translation is reduced. The present invention enhances the quality of the end result by pre-editing the closed caption data to recognize and correct this class of errors.

Another linguistic problem with real-time closed caption data is that a varying percentage of the text stream is complete sentences. This percentage often ranges from more than 85% in pre-written news broadcasts to as little as 20% in the unrehearsed speech of some speakers. The pre-editing techniques of the present

invention identify incomplete sentences before they are passed to the translation software. In some cases, incomplete sentences are expanded to structures that are easier for the translation software to handle. In other cases, they may simply be flagged so that they are not treated as full sentences by the translation software. In either case, the result is a more accurate translation of the closed caption data.

The vocabulary set for real-time broadcasts such as news presents yet another problem. In general, the vocabulary is broad and varied and therefore, requires ongoing additions to the machine translation software's dictionaries. The present invention addresses this problem by building specialized dictionaries according to topics. These specialized dictionaries are used in the translation process to produce higher quality translations. In addition to building dictionaries, topic changes are automatically identified during a program to determine which dictionary is appropriate for the context of the program. The building and automatic selecting of specialized dictionaries results in higher quality translations of closed caption data.

Referring to Fig. 5, the automated pre-editing process of the present invention comprises the following steps. First, in step 500, specialized dictionaries are developed according to topic. The context of a particular program may be very important in developing correct translations. The use of topic-based dictionaries for use by the machine translation software allows for more accurate translations. In the next step 502, the current program topic is identified to determine which dictionary should be used by the machine translation software. The topic may be identified by examining the frequency of the occurrence of certain key words or phrases. Other techniques may be

used to identify the appropriate topic. Once a dictionary is selected for the machine translation software, the process of translating incoming CC data may begin.

In step 504, phonetically based and other spelling errors occurring in the incoming text stream are corrected. Dictionaries that comprise phonetic spellings and associated correct spellings may be used to complete the correction of spelling errors. In the next step 506, sentence boundaries are identified and demarcated. In step 508, clause boundaries are identified and demarcated. After the sentence and clause boundaries are identified and demarcated, punctuation is added to the sentences and clauses, as appropriate in step 510. In step 512, ellipses appearing in the text stream are identified and text is inserted to complete the sentence. For unaccented text, accents are inserted where appropriate in step 514. In step 516, the speaker is identified based on CC position or voice print so the proper identifying information may be added to the output. Finally, in step 518, the pre-editing process checks for the end of the text stream to determine whether there is additional CC text to translate. If there is additional CC text to translate, the pre-editing process continues. Steps 502 to 516 are repeated for the incoming CC text.

The present invention translates closed caption data received from a live or taped television broadcast virtually in real-time so that a viewer can read the closed caption data in his or her preferred language during the broadcast. The present invention instantly localizes television program content by translating the closed caption data from a source language to a target language. The process of the present invention is fully automated, and includes a text flow management process and a pre-editing process that may be used in conjunction with any machine translation system. Various

modifications and combinations can be made to the disclosed embodiments without departing from the spirit and scope of the invention. All such modifications, combinations, and equivalents are intended to be covered and claimed.

WHAT IS CLAIMED IS:

1. A system for closed caption data translation, comprising:

a closed caption decoder for extracting closed caption codes from a signal comprising closed caption data;

a server adapted to receive said closed caption codes from said closed caption decoder and translate text in said closed caption codes; and

a device for receiving translated text from said server.

2. The system of claim 1 wherein said device is a closed caption encoder.

3. The system of claim 1 wherein said device is a subtitler.

4. The system of claim 1 wherein said device is a text-to-speech module.

5. The system of claim 1 wherein said signal is from a television broadcast.

6. The system of claim 1 wherein said signal is from a videotape recorder.

7. The system of claim 1 wherein said server comprises text flow management software.

8. The system of claim 1 wherein said server comprises pre-editing software.

9. A method for translating closed caption data comprising the steps of:

receiving program source signals;

decoding text from closed caption data in said program source signals;

translating said text from a source language to a target language;

inserting said target language text in program destination signals; and

transmitting said program destination signals to a program destination.

10. The method of claim 9 wherein the step of receiving said program source signals comprises the step of receiving said program source signals from a broadcast.

11. The method of claim 9 wherein the step of receiving said program source signals comprises the step of receiving said program source signals from a videotape recorder.

12. The method of claim 9 wherein the step of inserting said target language text in program destination signals comprises the step of inserting said target language text in program destination signals as subtitles.

13. The method of claim 9 wherein the step of inserting said target language text in program destination signals comprises the step of inserting said target language text in program destination signals as closed captions.

14. The method of claim 9 wherein the step of inserting said target language text in program destination signals comprises the step of inserting said target language text in program destination signals as a separate audio program.

15. The method of claim 9 wherein the step of pre-editing said text comprises the steps of:

identifying a topic to select a dictionary for translation;

correcting spelling errors;

identifying and demarcating sentence boundaries;

identifying and demarcating phrase boundaries;

identifying and demarcating personal, business and place names;

adding punctuation;

identifying ellipses and inserting text; and

detecting unaccented text and inserting accents.

16. The method of claim 15 further comprising the step of identifying a speaker.

17. An apparatus for closed caption translation comprising:

a server adapted to receive closed caption codes and transmit text in a target language; and

machine translation software on said server for translating text in said closed caption codes from a source language to said target language.

18. The apparatus of claim 17 further comprising pre-editing software on said server for pre-editing text in said source language.

19. The apparatus of claim 18 wherein said pre-editing software is adapted to:

identify a topic to select a dictionary for translation;

correct spelling errors;

identify and demarcate sentence boundaries;

identify and demarcate phrase boundaries;

identifying and demarcating personal, business and place names;

add punctuation;

identify ellipses and inserting text to fill said ellipses; and

detect unaccented text and inserting accents.

20. The apparatus of claim 18 wherein said text in a target language comprises translated titles.

21. The apparatus of claim 18 wherein said text in a target language comprises translated closed caption data.

22. The apparatus of claim 18 wherein said text in a target language comprises translated audio.

## ABSTRACT

A system and method is disclosed for translating closed caption data from a source language to a target language during a broadcast. The system and method are fully automated to provide accurate and timely translations of closed caption data. The system and method include a text flow management process and a pre-editing process that may be used in conjunction with any machine translation system. The text flow management process facilitates the input of closed caption data in a source language from a program source to the output of closed caption data in a target language to a program destination. The pre-editing process improves the quality of translation performed by machine translation software by addressing various problems associated with real-time translation of closed caption data.

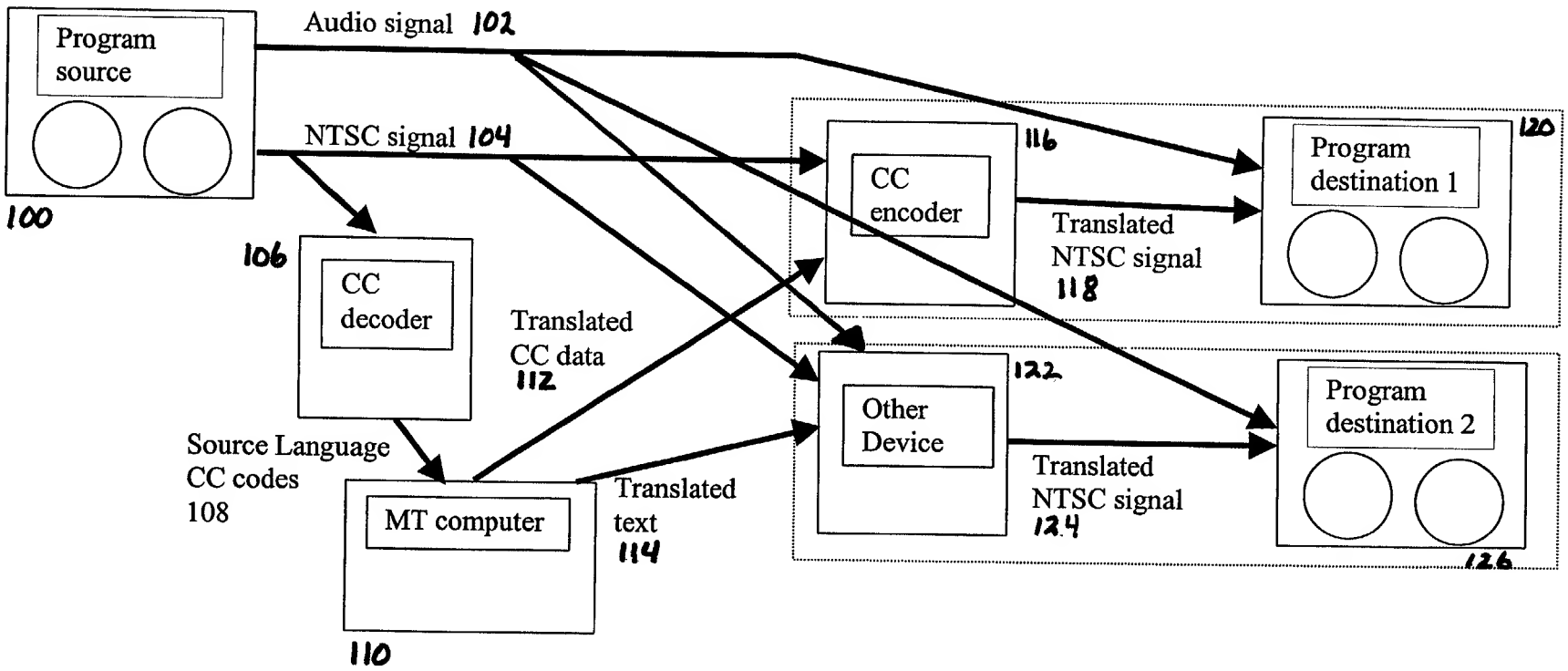
Program source
100
Audio signal 102
NTSC signal 104
106
CC decoder
Translated CC data 112
Source Language CC codes 108
MT computer
110
Translated text 114
CC encoder
116
Translated NTSC signal 118
Program destination 1
120
Other Device
122
Translated NTSC signal 124
Program destination 2
126

*Fig. 1*

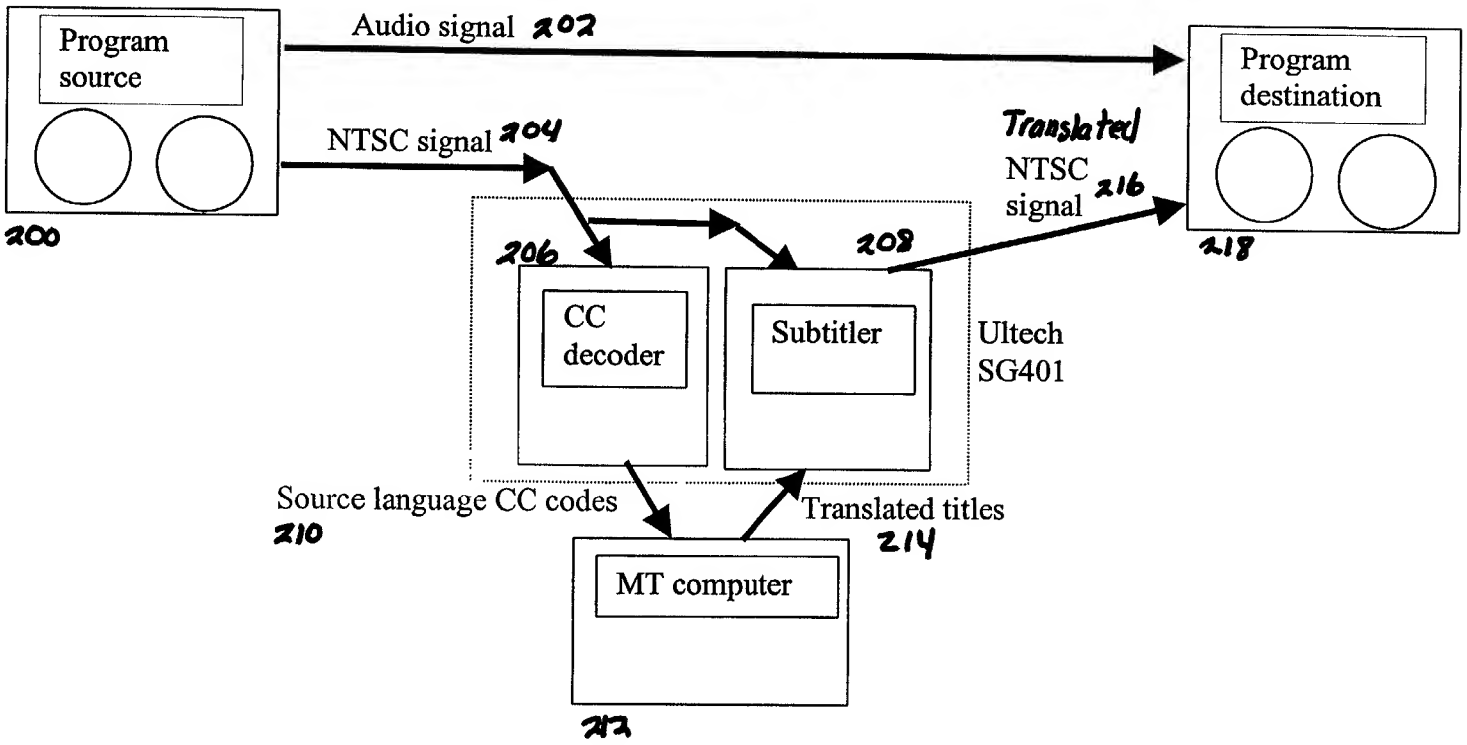
Program source
Audio signal 202
Program destination
NTSC signal 204
Translated NTSC signal 216
200
218
206
208
CC decoder
Subtitler
Ultech SG401
Source language CC codes 210
Translated titles 214
MT computer
212

*Fig. 2*

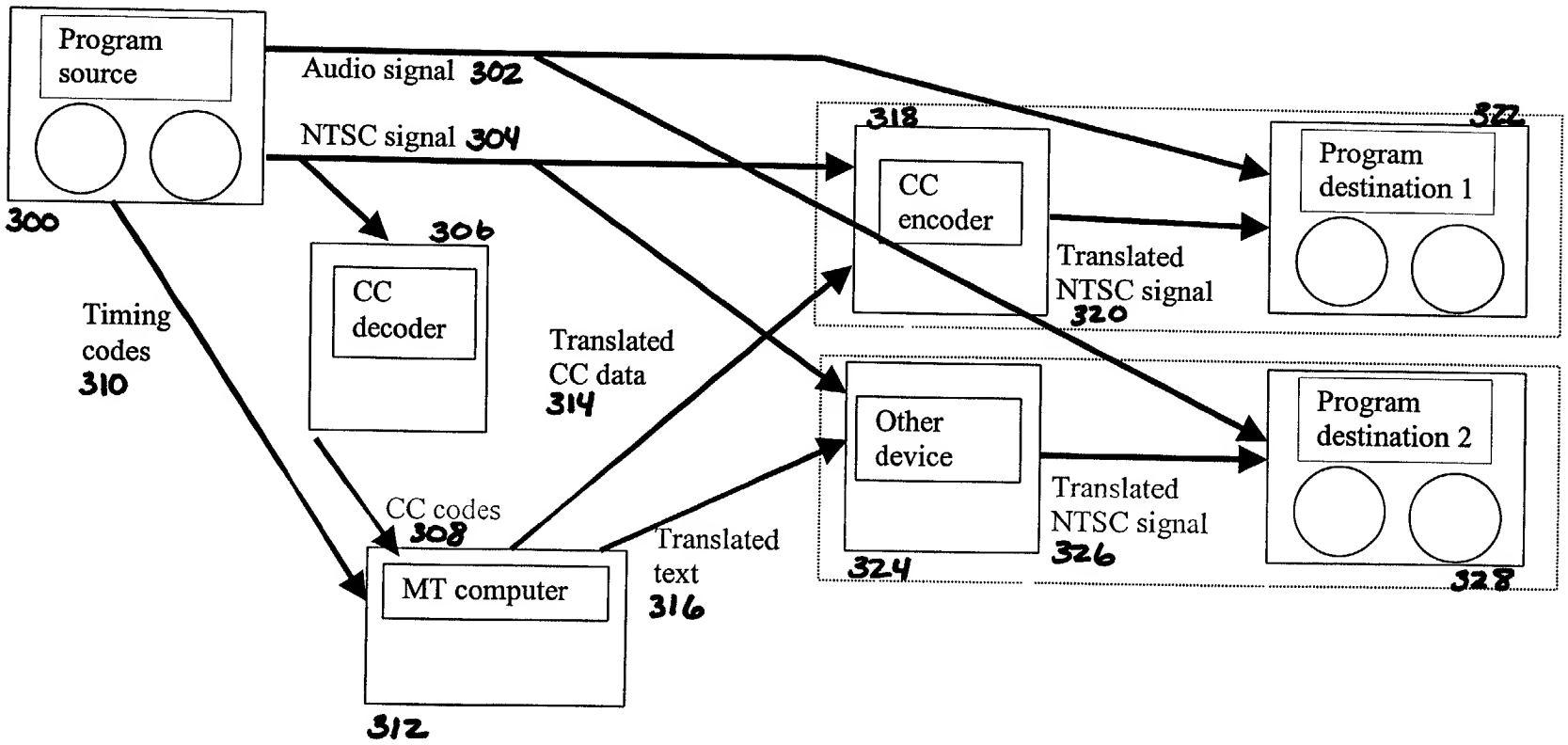
Program source
300
Audio signal 302
NTSC signal 304
306
CC decoder
Timing codes 310
Translated CC data 314
CC codes 308
MT computer
312
Translated text 316
318
CC encoder
Translated NTSC signal 320
322
Program destination 1
Other device
324
Translated NTSC signal 326
Program destination 2
328

*Fig. 3*

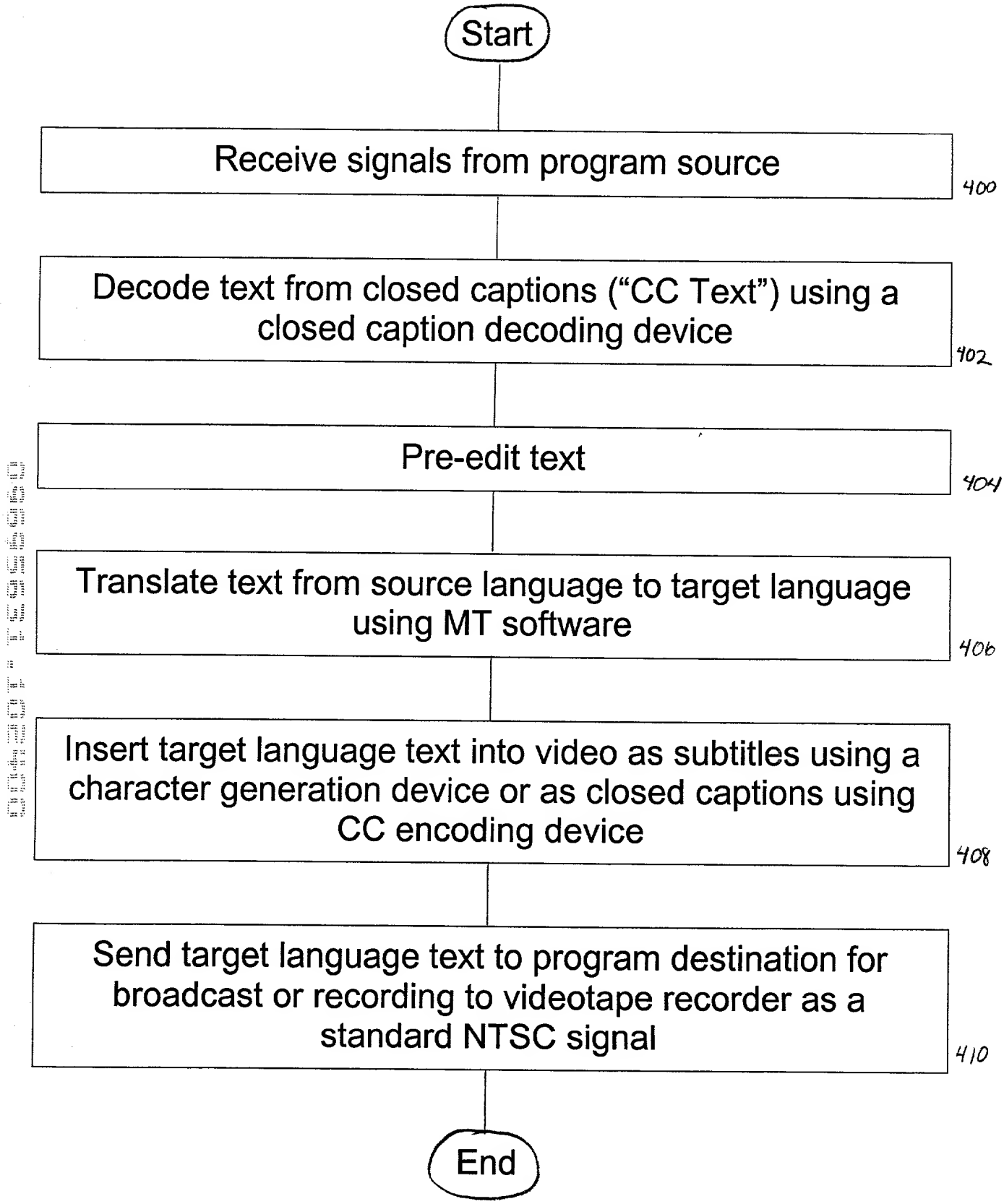
Start
Receive signals from program source
400
Decode text from closed captions ("CC Text") using a closed caption decoding device
402
Pre-edit text
404
Translate text from source language to target language using MT software
406
Insert target language text into video as subtitles using a character generation device or as closed captions using CC encoding device
408
Send target language text to program destination for broadcast or recording to videotape recorder as a standard NTSC signal
410
End

*Fig. 4*

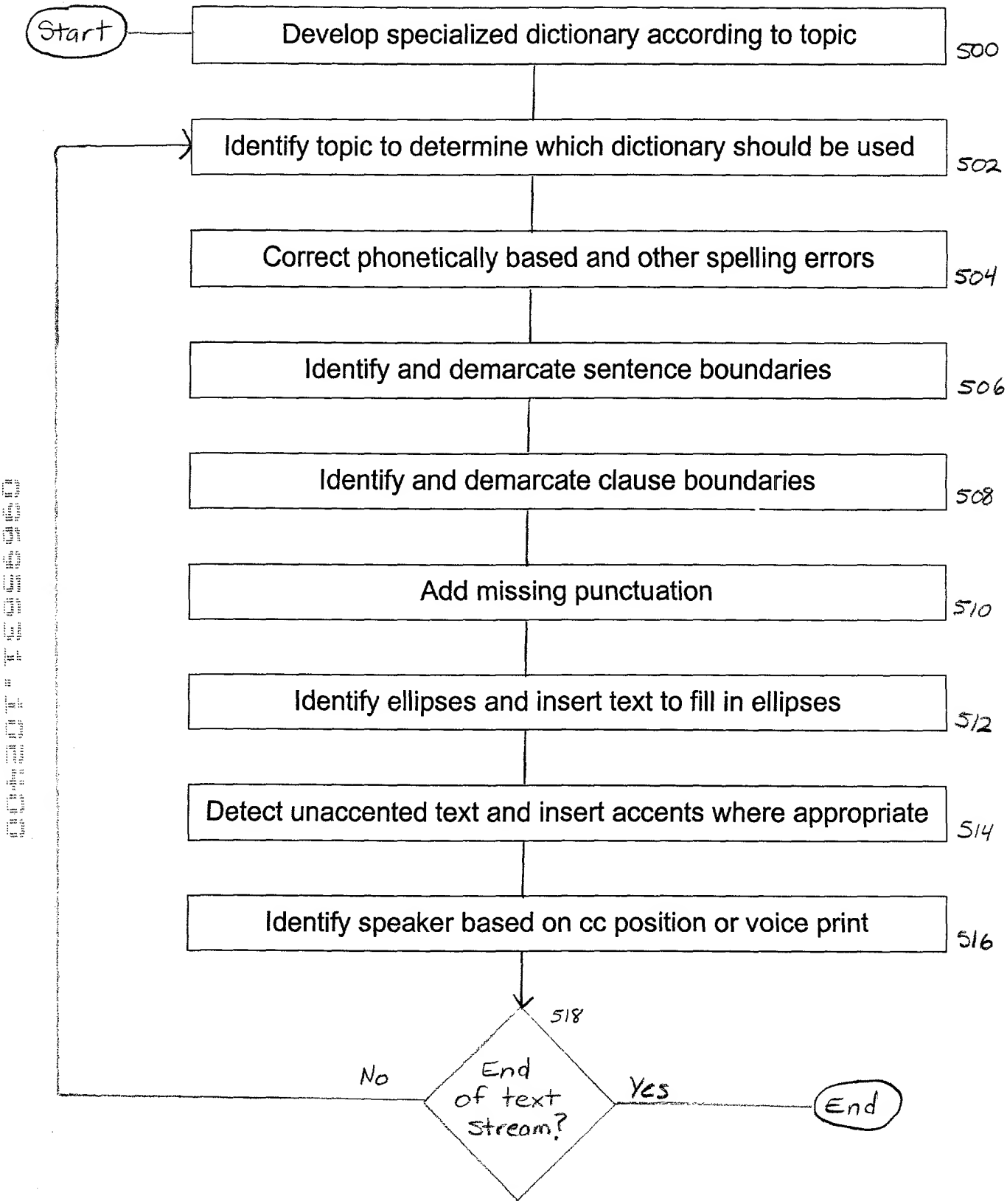
Start
Develop specialized dictionary according to topic
500
Identify topic to determine which dictionary should be used
502
Correct phonetically based and other spelling errors
504
Identify and demarcate sentence boundaries
506
Identify and demarcate clause boundaries
508
Add missing punctuation
510
Identify ellipses and insert text to fill in ellipses
512
Detect unaccented text and insert accents where appropriate
514
Identify speaker based on cc position or voice print
516
518
End of text stream?
No
Yes
End

*Fig. 5*

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# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

[X] Declaration Submitted with Initial Filing OR [ ] Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

| | |
|---|---|
| Attorney Docket Number | MUL1612-002 |
| First Named Inventor | Flanagan et al. |
| *COMPLETE IF KNOWN* | |
| Application Number | / |
| Filing Date | October 24, 2000 |
| Group Art Unit | |
| Examiner Name | |

**As a below named inventor, I hereby declare that:**

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

SYSTEM AND METHOD FOR CLOSED CAPTION DATA TRANSLATION

*(Title of the Invention)*

the specification of which

[XX] is attached hereto

OR

[ ] was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International Application Number [ ] and was amended on (MM/DD/YYYY) [ ] (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed

| Prior Foreign Application Number(s) | Country | Foreign Filing Date (MM/DD/YYYY) | Priority Not Claimed | Certified Copy Attached? YES | Certified Copy Attached? NO |
|---|---|---|---|---|---|
| | | | [ ] | [ ] | [ ] |
| | | | [ ] | [ ] | [ ] |
| | | | [ ] | [ ] | [ ] |
| | | | [ ] | [ ] | [ ] |

[ ] Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

| Application Number(s) | Filing Date (MM/DD/YYYY) |
|---|---|
| | |

[ ] Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.



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# DECLARATION -- Utility or Design Patent Application

I hereby claim the benefit under 35 U.S C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C 11 2, 1 acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

| U.S. Parent Application or PCT Parent Number | Parent Filing Date (MM/DD/YYYY) | Parent Patent Number (if applicable) |
|---|---|---|
| | | |

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☒ Customer Number [ ] → [barcode]
*OR*
☐ Registered practitioner(s) name/registration number listed below

| Name | Registration Number | Name | Registration Number |
|---|---|---|---|
| | | | |

08698
PATENT_TRADEMARK OFFICE

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☒ Customer Number or Bar Code Label [barcode] OR ☐ Correspondence address below

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| Address | 08698 PATENT_TRADEMARK OFFICE | | | | |
| Address | | | | | |
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S C 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon

**Name of Sole or First Inventor:** ☐ **A petition has been filed for this unsigned inventor**

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| MARY A. | FLANAGAN |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Inventor's Signature | Mary A. Flanagan | | | | | Date | 10/28/00 |
| Residence City | Framingham | State | MA | Country | USA | Citizenship | USA |
| Post Office Address | 4 Billings Way | | | | | | |
| Post Office Address | | | | | | | |
| City | Framingham | State | MA | ZIP | 01701 | Country | USA |

☒ **Additional inventors are being named on the** 1 **supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto**

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# DECLARATION

**ADDITIONAL INVENTOR(S)**
**Supplemental Sheet**
Page 1 of 1

| **Name of Additional Joint Inventor, if any:** | ☐ A petition has been filed for this unsigned inventor | | | | | | |
|---|---|---|---|---|---|---|---|
| Given Name (first and middle [if any]) | | Family Name or Surname | | | | | |
| PHILIP | | JENSEN | | | | | |
| Inventor's Signature | Philip Jensen | | | | | Date 10/19/00 | |
| Residence: City | ~~Columbus~~ Mountain View | State ~~OH~~ CA | | Country USA | | Citizenship | USA |
| Post Office Address | ~~165 East Lakeview Avenue~~ 1182 Clark Ave | | | | | | |
| Post Office Address | | | | | | | |
| City | ~~Columbus~~ Mountain View | State ~~OH~~ CA | ZIP ~~43202~~ 94040 | | Country | USA | |

| **Name of Additional Joint Inventor, if any:** | ☐ A petition has been filed for this unsigned inventor | | | | | | |
|---|---|---|---|---|---|---|---|
| Given Name (first and middle [if any]) | | Family Name or Surname | | | | | |
| DOUGLAS P. | | CHINNOCK | | | | | |
| Inventor's Signature | Douglas P Chinnock | | | | | Date 10/16/00 | |
| Residence: City | Tucson | State AZ | | Country USA | | Citizenship | USA |
| Post Office Address | 1315 East Kleindale Road | | | | | | |
| Post Office Address | | | | | | | |
| City | Tucson | State AZ | ZIP 85719 | | Country | USA | |

| **Name of Additional Joint Inventor, if any:** | ☐ A petition has been filed for this unsigned inventor | | | | | | |
|---|---|---|---|---|---|---|---|
| Given Name (first and middle [if any]) | | Family Name or Surname | | | | | |
| | | | | | | | |
| Inventor's Signature | | | | | | Date | |
| Residence: City | | State | | Country | | Citizenship | |
| Post Office Address | | | | | | | |
| Post Office Address | | | | | | | |
| City | | State | ZIP | | Country | | |

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